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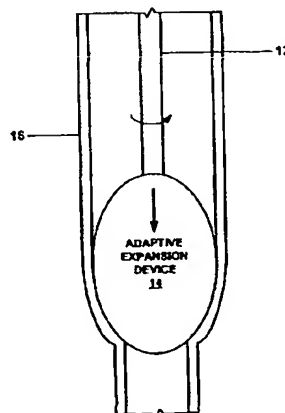
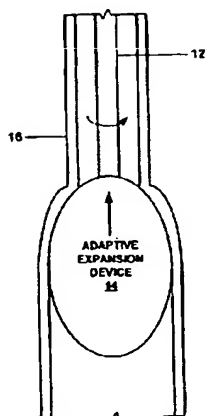
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- (71) Applicant (for all designated States except US): **ENVEN-
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- (72) Inventors; and
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- Declaration under Rule 4.17:
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[Continued on next page]

(54) Title: **APPARATUS AND METHOD FOR RADIALLY EXPANDING A WELLBORE CASING USING AN ADAPTIVE EXPANSION SYSTEM**



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(57) Abstract: An apparatus and method for radially expanding a wellbore (34) using an adaptive expansion device (14).

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| A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : E21B 43/10, 23/00 US CL : 166/380, 207, 214, 250.01 According to International Patent Classification (IPC) or to both national classification and IPC | | |
|--|--|---|
| B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 166/380, 207, 214, 250.01 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Please See Continuation Sheet | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| T | US 6,722,427 B2 (GANO et al) 20 April 2004 (20.04.2004), claims 10, 25, and 29. | 13-18 |
| T | US 2004/0065446 A1 (TRAN et al) 08 April 2004 (08.04.2004), paragraphs [0054] and [0057]. | 13-18 |
| X, P | US 6,688,397 B2 (MCCLURKIN et al) 10 February 2004 (10.02.2004), column 6, lines 40-49. | 13-18 |
| A | US 5,253,713 A (GREGG et al) 19 October 1993 (19.10.1993), Figures 3 and 6-8, column 6, lines 57-66. | 1-3 |
| A | US 5,749,585 A (LEMBCKE) 12 May 1998 (12.05.1998), column 1, lines 45-55 and column 3, line 55 through column 4, line 8. | 1-3 |
| A | US 5,282,508 A (ELLINGSEN et al) 01 February 1994 (01.02.1994), column 19, lines 47-50 and claim 7. | 4-6 |
| A | US 6,012,521 A (ZUNKEL et al) 11 January 2000 (11.01.2000), column 13, lines 44-51. | 4-6 |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex. | | |
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Continuation of B. FIELDS SEARCHED Item 3:
EAST: expansion cone, expansion tool, expansion device, expansion member, adaptive, spring rate, damping rate, adjusting frequency,
adjusting operating characteristic

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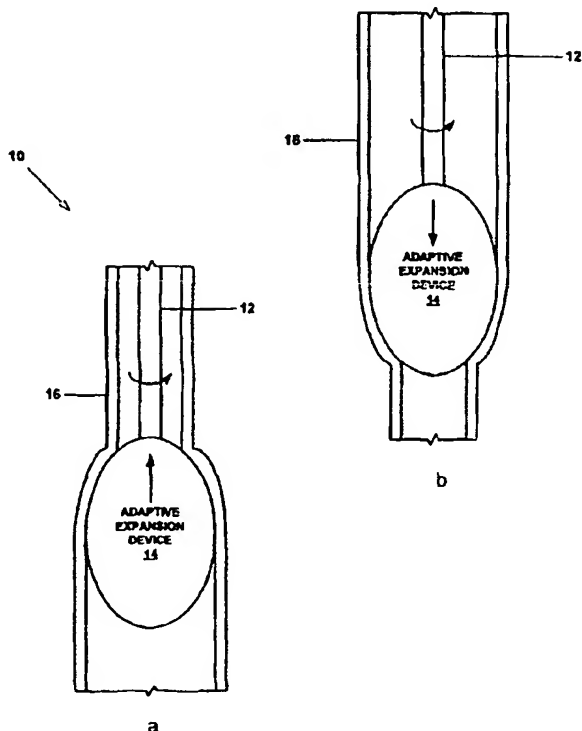
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AMENDED CLAIMS

[received by the International Bureau on 04 Mars (04.03.2005);
new claims 31-33 added; remaining claims unchanged (2 pages)]

24. The method of claims 2, 5, 8, 11, 14, or 17, wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
displacing the adaptive expansion device relative to the tubular member in the longitudinal direction.

25. The method of claims 2, 5, 8, 11, 14, or 17, wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
rotating the adaptive expansion device relative to the tubular member.

26. The method of claims 2, 5, 8, 11, 14, or 17, wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
applying a pressurized fluid to the interior surface of the tubular member.

27. The system of claims 3, 6, 9, 12, 15, or 18, wherein the means for radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
means for displacing the adaptive expansion device.

28. The system of claim 27, wherein the means for displacing the adaptive expansion device comprises one or more degrees of freedom.

29. The system of claim 27, wherein the means for displacing the adaptive expansion device comprises a plurality of degrees of freedom.

30. The system of claims 3, 6, 9, 12, 15, or 18, wherein the means for radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
means for radially expanding and plastically deforming the tubular member using a hydro-forming device.

31. The apparatus of claims 1, 4, 7, 10, 13, or 16, wherein one or more of the expansion device segments comprise:
one or more expansion surfaces; and
an actuator coupled to the expansion surfaces;
wherein the actuator comprises a plurality of degrees of freedom;
wherein the actuator comprises one or more rotary actuators; and

wherein one or more of the expansion device segments comprise:
one or more hydro-forming devices.

32. The method of claims 2, 5, 8, 11, 14, or 17, wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
displacing the adaptive expansion device relative to the tubular member in the longitudinal direction;
wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
rotating the adaptive expansion device relative to the tubular member; and
wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
applying a pressurized fluid to the interior surface of the tubular member.

33. The system of claims 3, 6, 9, 12, 15, or 18, wherein the means for radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
means for displacing the adaptive expansion device;
wherein the means for displacing the adaptive expansion device comprises a plurality of degrees of freedom; and
wherein the means for radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:
means for radially expanding and plastically deforming the tubular member using a hydro-forming device.

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